Table 1
East Waterway Anthropogenic Background Estimation: Green River Suspended Solids and Whole Water Data Sufficiency

Study	Acceptability						Representativeness			
		Field		Analytical						
	Documentation (Report; Data Availability)	Methods	QA/QC, Sampling Comparability	Laboratory/Methods	Detection Limits	QA/QC Samples, Data Validation	Geographical	Temporal	Physical (Grain Size)	Land Use
Suspended Solids										
USGS Green River Loading Study	Conn et.al. 2015, 2016, 2018a, 2018b; Conn and Black 2014; Senter et.al. 2018; EIM Study IDs: GRNRVLD13, GRNRVLD14, GRNRVLD16	Pump water from 3 feet above bed and 30 feet from shore into Teflon-lined drum before laboratory centrifugation of 1,000 to 2,000 liters (Phase 1) or continuous flow field centrifugation (Phases 2 and 3) (Conn et. al. 2016)	Field replicates, equipment blanks, and trip blanks included.	Washington State-accredited laboratories and EPA-approved methods *PCB:* Congeners, AXYS; EPA 1668A/C *DF*: Congeners, AXYS; EPA 1613B *As*: ARI/MEL EPA 200.8/6020 *Grain Size:* Guy 1969 *TOC:* PLUMB81TC, PSEP-TOC	*PCB and DF*: Congener data include some non-detected and estimated values (J flag) consistent with low concentrations evaluated in the analysis. Aroclor split samples have been screened out because they had high percentages of non-detects and the same samples were also analyzed for congeners. *As*: All detected.	Standard USGS quality-assurance procedures (i.e., employee review of chemistry QA/QC). QA/QC samples included trip blank, lab blank, and matrix spike, as applicable.	RM 10.4: Upstream of EW/LDW and salt wedge.	*Age*: Recent data (2014 to 2017). *Sampling Time Frame*: Centrifuge solids represent a ~24- to 48-hour snapshot *Flow Conditions*: The samples characterize Green River flow categories over several seasons: significant dam release, storm event with and without significant dam release, and baseline.	Suspended solids are primarily fine-grained. Suspended sediment fines: 40% to 95%; mean 73.5%.	Green River solids at RM 10.4 reflect upstream and local land use (natural resource/ agriculture 68%; commercial/industrial 13%; and residential 19%). The commercial/ industrial development is newer relative to these land use inputs from more urban land within the LDW and EW basins (downstream of RM 5).
King County Green River Watershed Suspended Solids Data Report	King County 2016; King County data request (Green River Flaming Geyser and Green River tributaries [Newaukum Creek, Soos Creek, Mill Creek, Black River, Springbrook Creek])	Filter solids and sediment traps (baffle and jar style traps) • Baffle intake 11 inches from the bed • Jar intake 9 inches from the bed • Filter solids intake ~2 feet from bed; water pumped through 5-µm polypropylene felt filter	Comparison of three sampling methods built into the study. Equipment blank was included for both baffle and filtered solids; no field replicates due to limited field equipment and sample volume.	Washington State-accredited laboratories and EPA-approved methods. *PCB:* Congeners, AXYS and PRL; EPA 1668C *DF*: Congeners, AXYS and PRL; EPA 1613B *As*: KCEL EPA Method 3050B/6020A *PSD:* ASTM Method D422 or ASTM D422/ D3977-97 and laser diffraction by ISO 13320:2009E *TOC:* EPA 9060	*PCB and DF*: congener data include some non-detected and estimated values (J flag) consistent with low concentrations evaluated in the analysis. Aroclor split samples have been screened out because had high percentage of non-detects and same Green River samples also analyzed for congeners. *As*: all detected	QA/QC samples included for each sample batch (e.g., laboratory blank, laboratory duplicate, matrix spike, as applicable). PCB and DF Congeners validated by LDC; As and conventional data validated by King County WLRD Science Section.	RM 10.4: Upstream of EW/LDW and salt wedge. Additional study locations/samples from further upstream within the Green River and from four major tributaries are available but are screened out because downstream at RM 10.4 is most representative of all upstream inputs.	*Age*: Recent data (2012 to 2015). *Sampling Time Frame*: Filter solids represent a ~24- to 48-hour snapshot. Sediment traps represent a 3-month time-weighted average. *Flow Conditions*: The samples characterize Green River flow categories over several seasons: significant dam release, storm event with significant dam release, and baseline.	Suspended solids are primarily fine grained. Sediment trap fines: 18% to 85%; mean 47.8%. Filtered solids fines: 49% to 80%; mean 63%. Note some sediment trap samples have lower percent fines that would not be representative of material depositing in EW.	Same as USGS Green River Loading Study.

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	Documentation (Report; Data Availability)	Field		Analytical			Geographical	Temporal	Physical (Grain Size)	Land Use
		Methods	QA/QC, Sampling Comparability	Laboratory/Methods	Detection Limits	QA/QC Samples, Data Validation				
Ecology Contaminant Loading Study	Gries and Sloan 2009; EIM Study ID LDW_08	Field centrifuge • Intake targeted 0.6 times the mid-channel depth, with modifications based on stage height, tidal phase, salinity, and the maximum water depth	Sample replicates; comparison to sieved samples; field blanks.	Washington State-accredited laboratories and EPA-approved methods *PCB:* Aroclors, MEL; EPA8082 *DF*: Congeners, PRL; EPA1613B *As*: MEL EPA Method 3050B/200.8 TOC: PSEP-TOC	*PCB:* Three of seven samples, all Aroclors, are non-detect at ~ 2.5 µg/kg. *DF*: Congener data include some non-detected and estimated values (J flag) consistent with low concentrations evaluated in the analysis. *As*: All detected.	QAPP referenced but source document not found to confirm QA/QC laboratory requirements. Validated by EPA.	RM 6.8: Upstream of LDW/EW; some impact from salt wedge.	*Age*: January to July 2009. *Sampling Time Frame*: Centrifuge solids represent a ~24-hour snapshot. *Flow Conditions*: Green River flow categories: four baseline, one storm event, and two significant dam releases (as assessed by EWG using available storm and flow data).	Suspended solids are primarily fine-grained. Sample fines: 79% to 94% estimated based on TSS data.	Generally similar to USGS Green River Loading Study, approximately 3.5 miles farther downstream. Location farther downstream increases commercial/industrial land use percentage slightly.
Whole Water										
LDW Pre-Design Baseline Study	Windward 2020; LDWG AOC3 Database	Mid-depth Niskin bottle samples; composites of four grab samples	Field replicate and equipment blank included.	Washington State-accredited laboratories and EPA-approved methods *PCB*: Congeners, AXYS; EPA 1668C *DF*: Congeners, AXYS; EPA 1613B *As*: N/A (inorganic arsenic data only) *TSS, ARI*: SM 2540-D	*PCB and DF*: Congener data include some non-detected and estimated values (J flag) consistent with low concentrations evaluated in the analysis. *As*: Samples were screened out because only inorganic As tested.	QA/QC samples included for each sample batch. Validated by EcoChem.	RM 10.4: Upstream of EW/LDW and salt wedge.	*Age*: 2017 to 2018. *Sampling Time Frame*: Represents a 4-hour snapshot. *Flow Conditions*: Green River flow categories: targeted storm with and without significant dam release and baseline.	Whole water captures freely dissolved, particulates, and colloids. Requires normalizing whole water samples by TSS to estimate particulate concentrations.	Same as USGS Green River Loading Study.
King County streams monitoring program; Green River Watershed Water Quality Assessment; Green River Watershed Water Data Report; and PCB Equipment Blank Study	King County 2018a, 2018b; AECOM 2012	Mix of sample types: grab samples, ISCO autosamplers, and composites of multiple grab samples	Field replicates and equipment blanks included.	Washington State-accredited laboratories and EPA-approved methods *PCB*: Congeners, AXYS and PRL; EPA Method 1668A/C *DF*: Not analyzed *Total and Dissolved As*: KCEL EPA method 200.8. *TSS*: SM 2540-D	*PCB*: Congener data include some non-detected and estimated values (J flag) consistent with low concentrations evaluated in the analysis. *As*: All detected.	QA/QC samples included for each sample batch. PCB congeners validated by LDC; As and conventional data validated by King County WLRD Science Section or Herrera Environmental Consultants.	RMs 6.3 and 10.4 and 11.4: upstream of EW/LDW and two locations above salt wedge.	*Age*: 2000 to 2017. *Sampling Time Frame*: Represents a mix of points in time to 24-hour snapshots; repeated single grab samples can be representative of time trends. *Flow Conditions*: The samples characterize Green River flow categories over several seasons: significant dam release, storm event with and without significant dam release, and baseline.	Whole water captures freely dissolved, particulates, and colloids. Requires normalizing whole water samples by TSS to estimate particulate concentrations.	Same as USGS Green River Loading Study for RMs 10.4 and 11.4, and generally similar for approximately 4 miles downstream location at RM 6.3. RM 6.3 samples would increase commercial/industrial land use percentage slightly.

Study	Acceptability						Representativeness			
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		Methods	QA/QC, Sampling Comparability	Laboratory/Methods	Detection Limits	QA/QC Samples, Data Validation				
USGS Green River Loading Study	Conn et.al. 2016, 2015, 2018a, 2018b; Conn and Black 2014; Senter et.al. 2018; EIM Study IDs: GRNRVLD13, GRNRVLD14, GRNRVLD16	Field surface water sample using US D-96 sampler and 3-liter Teflon bags 3 feet from bed and 30 feet from shore. Multiple samples were taken until sufficient volume was collected.	Field replicates and trip blanks included.	Washington State-accredited laboratories and EPA-approved methods *PCB*: Congeners, AXYS; EPA 1668C *DF*: Congeners, AXYS; EPA 1613B *As*: ARI/MEL EPA 200.8/ 6020 *TSS*: ASTM D3977-97(2013)e1	*PCB and DF:* Congener data include some non-detected and estimated values (J flag) consistent with low concentrations evaluated in the analysis. Aroclor split samples have been screened out because they were all non-detects and the same samples were also analyzed for congeners *As*: All detected.	Standard USGS quality-assurance procedures (i.e., employee review of chemistry QA/QC). QA/QC samples included trip blank, lab blank, and matrix spike, as applicable.	RM 10.4: Upstream of EW/LDW and salt wedge.	*Age*: 2014 to 2017. *Sampling Time Frame*: Water represents a ~24- to 48-hour snapshot. *Flow Conditions*: Green River flow categories: significant dam release, storm event with and without significant dam release, and baseline.	Whole water captures freely dissolved, particulates and colloids. Filtered water samples represent freely dissolved and colloids. Requires normalizing whole water samples by TSS to estimate particulate concentrations.	See USGS Green River Loading Study.

Notes:

1. Consistent with data compiled by LDWG, NJs are totaled detects if above the lower method calibration limit (per Region 10 validation guidance). Data reported by USGS include NJs and non-detects.

µg/kg: micrograms per kilogram
µm: micrometer
ARI: Analytical Resources, Inc.
As: Arsenic
ASTM: ASTM International
DF: dioxin/furan
Ecology: Washington State Department of Ecology
EIM: Environmental Information Management database
EPA: U.S. Environmental Protection Agency
EW: East Waterway
KCEL: King County Environmental Laboratory
LDC: Laboratory Data Consultants, Inc.
LDW: Lower Duwamish Waterway
LDWG: Lower Duwamish Waterway Group
MEL: Manchester Environmental Laboratory
N/A: not available
NJ: non-detect estimated
PCB: polychlorinated biphenyl
PRL: Pacific Rim Laboratories
PSD: Particle size distribution
PSEP: Puget Sound Estuary Protocols
QA/QC: quality assurance/quality control
QAPP: Quality Assurance Project Plan
RM: river mile
SM: Standard Method
TOC: total organic carbon
TSS: total suspended solids
USGS: U.S. Geological Survey
WLRD: Water and Land Resources Division